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EVALUATION OF THE WATERSHED EDUCATION NETWORK'S FISH WEEK
PROGRAM

By

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Evaluation of the Watershed Education Network's Fish Week Program

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The Watershed Education Network (WEN) is a nonprofit environmental education program that aims to foster knowledge, appreciation, and awareness of watershed health through water-based education programs and field science experiences. Their Fish Week program for 7th graders at Washington Middle School has an overarching theme of watershed and ecosystem health and includes an introduction to aquatic invertebrates, native fish, fish habitats, bugs and dry fly comparison, and an introduction to fly fishing. This is a formative, outcome-based evaluation of the Fish Week program. I used pre and post program survey data from 2017 and 2018 as well as survey data from 8th grade students who participated in Fish Week in 2019 compared to a control group who did not. I also conducted interviews with teachers and WEN volunteers who have participated in Fish Week. Overall, students gained watershed knowledge from participating in Fish Week. Student values were the same for 8th graders who participated in Fish Week and those that did not, however, self-reported positive environmental behaviors were slightly higher for students who had participated in Fish Week. Secondly, this professional project aims to develop tools for future evaluation of Fish Week. I recommend that WEN change their pre and post program survey to focus on what students liked and disliked about Fish Week as well as how their values and behaviors changed after Fish Week. I developed a new survey as well as a knowledge assessment for WEN and teachers who are interested in what students learn during Fish Week. I also developed a new teacher survey and volunteer survey. This will help their evaluation in the future.

Introduction

The Watershed Education Network (WEN) is a non-profit environmental education organization in Missoula, Montana. They provide water-based education programs and field science experience to elementary, middle, and high school students throughout western Montana. Their mission is to foster knowledge, appreciation, and awareness of watershed health through science education and outreach (WEN, 2019). WEN provides a variety of school programs ranging from groundwater science, to aquatic invasive species, to school stream monitoring. This Master's project focuses on a program evaluation of WEN's Fish Week Program. For Fish Week, WEN partners with the Westslope Chapter of Trout Unlimited (WCTU) to teach Washington Middle School 7th grade classes about the important connections between healthy rivers and fish (WEN, 2019). This program includes a class session of introduction to watersheds, and aquatic insects, with exploration of preserved bugs and identification, as well as fieldtrip activities on native fish, fish habitat, aquatic macroinvertebrates, bugs and dry fly comparisons, and an introduction to fly fishing (WEN, 2019). Washington Middle School's 7th grade classes have participated in Fish Week since spring, 2015. The goals of Fish Week are to increase student knowledge of watershed health, native fish and their habitat, increase student awareness of the importance of clean, healthy rivers, and get students excited about recreating in their local streams and rivers. WEN describes Fish Week as "a perfect way to engage students in their local ecosystem and introduce fly fishing as a lifelong sport" (2019).

Fish Week consists of an in-class session and several days of field trips. WEN has found that doing an in-class presentation before field trips helps prepare students for their field trip day, introduce key watershed concepts, and outline expectations during the field trip (WEN, 2019). The in-class session is led by a WEN staff or trained intern and covers the qualities of a healthy

river, bio-indicators, and an introduction to aquatic macroinvertebrates. For the last two years the field trips have been held at Bancroft Pond due to high water concerns. Previous years were held along the Clark Fork River bank. Students participate in a riparian nature walk, mapmaking, aquatic invertebrate collection and observation, and fish habitat lesson. Then they are given an interactive introduction to fly casting instruction and practice by WCTU partners. Where feasible, the schools provide a \$150/class fee for participation in the program. WCTU funds the majority of the Fish Week program.

Small, non-profit environmental education organizations, like WEN, are limited by time, funding, and resources. These limitations mean that there is often little to no program evaluation done on a regular basis for these programs (Bourke, Bukist, & Herron, 2014). Program evaluation is the systematic assessment of the operation or outcomes of a program to contribute to the improvement of the program (Thomson & Hoffman). Evaluation is important to provide positive and constructive feedback for programs to make them better for both participants and stakeholders (UACES). The stakeholders in Fish Week are WEN, WCTU, and Washington Middle School.

WEN has not yet done any systematic evaluation of their Fish Week Program other than teacher evaluations. They use some evaluation tools, including pre and post program student surveys, and teacher feedback forms, but they have not had the capacity to put together a comprehensive and useful review.

This is primarily an outcome-based evaluation of the Fish Week Program. Outcome-based evaluations look at the changes in participants as a result of their participation in the program (UACES). This is a formative evaluation to provide information for program improvement in the future (Thomson & Hoffman). I have used survey data and interviews to

make recommendations for improvement of Fish Week. Secondly, I have worked with WEN to create some tools for future evaluation so WEN can incorporate formative evaluation as an annual element of their program.

Evaluator Bias:

This evaluation was done by me, Rennie Winkelman. I have been a WEN volunteer for two years and I was recently hired as a WEN employee. This comes with inherent bias towards WEN and their goals. I have done my due diligence to remain objective during this evaluation and have presented the data as consciously and completely as I can.

Evaluation Goals:

The goal of this evaluation is to give WEN insight into how Fish Week impacts students. They will be able to make changes to better meet their goals and the goals of their other stakeholders. The questions that this evaluation will aim to answer are:

1. Does Fish Week participation give students a greater knowledge of local watersheds and native fish species?
2. To what extent does Fish Week engagement influence students' values and behaviors towards protecting local watersheds and native fish?
3. What steps does WEN need to take to integrate effective program evaluation into their Fish Week Program?

Review of Related Literature:

Successful environmental education programs include a variety of characteristics, like active participation, hands-on observation, place-based learning, cooperation, investigation, and reflection (Stern et al., 2014). Studies on environmental education often focus on ecological knowledge, awareness, skills, attitudes, behaviors, and enjoyment (Stern et al., 2014). There has been a recent increase in research regarding the effectiveness of environmental education programs. However, the results of these studies are varied. There is a lot of variability in type of program, program goals, age and background of students, etc.. Dettman-Easles & Pease (1999) found that after a residential environmental education program, students had significantly more positive attitudes toward wildlife, and these changes were the same when tested three months later. Studies have found that students show significant changes towards more pro-environmental values, attitudes, and behaviors after an environmental education program (Constantinos et al., 2014). The same study showed gains in student understanding of ecology (Constantinos et al., 2014). Bogner (1998) found that an environmental education program fostered cognitive levels and favorable shifts in behavior. Other studies have also showed that environmental education programs increased students' knowledge, awareness, and intention to act (Zint et al., 2014, Rooney, 2013).

However, Bergman (2016) found that after a one-year environmental education project grade school students gained awareness of their potential to impact nature, but still did not show any changes in environmental appreciation or behavior. This may be because students' unique interests were not fostered (Bergman, 2016). Erdogan (2011) found that ecology-based nature education programs contributed to self-reported environmentally responsible behavior but changes in affect and knowledge were not significant. Likewise, Armstrong & Impara (1991) found few significant differences in attitude towards the environment as well as knowledge

between an experimental group that participated in an environmental education program and a control group that did not. Aminrad et al. (2013) found a strong relationship between environmental awareness and attitudes, but only a weak relationship between ecological knowledge and environmental awareness.

Recommendations for environmental education are also wide-spread and varied. Zint, et al. (2014) found that meaningful environmental education experiences are probably increasing environmentally responsible behavior, but the outcomes are variable and these experiences are not reaching their full potential. A variety of specific strategies have been recommended, like including science inquiry (Zint et al., 2014), teaching cause-effect relationships (Erdogan, 2011), and focusing on connectedness with nature (Frantz & Mayer, 2014, Scannell & Gifford, 2010). Chen-Yin et al. (2002) recommended that the teaching of environmental programs should be integrated with other school activities in order for them to be effective. Duerden & Witt (2010) found that direct field experiences helped catalyze environmental knowledge into a stronger motivating force to act rather than just learning environmental science in the classroom. Stern et al. (2014) showed that instructors that demonstrate passion and genuine care for environmental education have a larger impact on their students.

As environmental education programs become more prevalent, there has been a renewed effort to establish good evaluation practices for these programs. There is a growing national emphasis on educational accountability (Carlton-Hug & Hug, 2010). Evaluation can help organizations align their educational goals with their organizational mission (Heimlich, 2010). Residential environmental education centers may provide many students with the opportunity to learn about their local ecosystems, but they are often limited by time and resources (Stokking et al., 1999). Many program directors understand the necessity of conducting regular program

evaluation, but may not understand how to go about it (Bourke et al., 2014). There is a need for program evaluation tools that can be used easily and quickly so small, non-profit environmental education programs can incorporate them (Bourke et al., 2014). Carlton-Hug & Hug (2010) found that often overlooked challenges to program evaluation include diversity in the field of environmental education, lack of clear program objectives, and a need for more research approaches. Several tools have been developed to help environmental education programs start their own evaluation practices, like My Environmental Education Resource Assistant (MEERA) and the Organizational Assessment Tool developed by the National Environmental Education Advancement Project (Carlton-Hug & Hug, 2010).

Methods

The basic structure of this outcomes-based evaluation follows a logic model matrix (Appendix A). The logic model consists of inputs, activities, outputs, outcomes, and impacts. Inputs include volunteers, time, money, materials, and facilities (Thomson & Hoffman). Activities are what you do with the inputs, including the in-class lessons and field trips (Thomson & Hoffman). Outputs are the direct st

atistics of participation in the program, like how many students attended (Thomson & Hoffman). Outcomes are the changes that occur as a result of participation in the program. These can be grouped into short-term changes, like knowledge, skills, and awareness, or long-term changes like behaviors, practice, and social action (Thomson & Hoffman). Impacts are the long-term changes to the community that you hope your program will help illicit (Thomson and Hoffman).

Participants:

This evaluation focuses on 7th and 8th grade students at Washington Middle School (WMS). I collected 170 pre and 91 post program surveys from 7th grade WMS students who participated in Fish Week in 2017 and 2018. 63 WMS 8th graders who participated in Fish Week the previous year, 2019, were surveyed. A control group of 56 8th graders from Meadowhill Middle School who did not do Fish Week in 2019 were given the same survey. Of the 56 control group students, 73% remember going on a field trip to the river in the past, but not the previous year, and 27% do not remember ever going on a field trip to the river. The demographics of Meadowhill Middle School and Washington Middle School are different which may be a confounding factor, however the students surveyed were in a similar level 8th grade science curriculum between both schools. All student participants will remain anonymous and participation was voluntary. To gain further insight interviewed WMS 7th grade teachers, and WEN volunteers and staff.

Instruments:

I will be using several tools for this program evaluation. First, I will be using pre-program (Appendix B), and post- program (Appendix B) surveys that were written by WEN staff and given to 7th grade Fish Week participants in 2017 and 2018. The Fish Week curriculum remained largely the same between 2017 and 2018. These surveys are primarily a knowledge assessment. They also have a qualitative question to assess students' opinions on the importance of watersheds at the end of the survey. Second, WEN staff and I have developed a survey for 8th grade students (Appendix C). This survey addresses knowledge, values, and behaviors of students one year after they participated in Fish Week. In developing this survey I worked with current and former teachers to make sure that the questions were appropriate for 8th grade

students and valid for the desired analysis. Finally, I will be conducting semi-structured interviews with teachers and WEN volunteers and staff.

Does Fish Week participation give students a greater knowledge of watersheds and native fish species?

To address this question, I evaluated the knowledge assessment part of the student pre-program surveys and post-program surveys that were given to 7th grade Fish Week participants. This is question 1-6 on the pre and post program survey (Appendix B). The pre-program surveys were given at the beginning of the week during the in-class lesson. The post-program surveys were given to students by their teacher at the end of the week. The knowledge assessment part of this survey (questions 1-6) focuses on students' knowledge of healthy watersheds. Each question was scored out of 2 points for a total score out of 12, and I did a quantitative comparison of means for pre-program and post-program knowledge. I also used the knowledge assessment portion of the 8th grader survey (questions 1-2, Appendix C) from the WMS students and the control group students to address knowledge retention for Fish Week participants one year later compared to students who did not participate in Fish Week. In the teacher interviews, I asked if they see an improvement in their students' science knowledge after participating in Fish Week.

To what extent does Fish Week engagement influence students' values and behaviors towards protecting local watersheds and native fish?

To address this question, I looked at question 7 of the 7th grade pre- and post- program surveys that asks students if they think watersheds are important and why. I compiled key words from the pre-program surveys and the post-program surveys and both quantitatively and

qualitatively compared them. The 8th grader survey focuses on how and why students value local watersheds and behaviors related to promoting watershed health. I compared the values and behaviors of WMS 8th grade students who participated in Fish Week the previous year to a control group of 8th graders who did not participate in Fish Week. This will be mainly a quantitative comparison. 8th graders are also asked how they feel around rivers and if they think that the watersheds around Missoula make Missoula special (question 5-6, Appendix C).

What steps does WEN need to take to integrate effective program evaluation into their Fish Week program?

Part of this professional project effort was to develop tools and strategies for WEN to integrate formative program evaluation into their Fish Week program. Through this process I have seen which current tools are effective and some changes that can be made. I have created new tools for WEN and WMS to use to evaluate Fish Week. These include a pre and post program quiz for students, a pre and post program survey for students, a post program survey for teachers, and a post program survey for volunteers. All of these will be integrated into an online format that will be used for easier data entry and analysis. This will help WEN make changes as needed from year to year so they can meet their goals for Fish Week.

Interviews:

I interviewed Mrs. Windell, a WMS 7th grade science teacher, former WEN board member and co-creator of Fish Week who has been bringing her students to Fish Week since it began. I wanted to gain insight into what parts of Fish Week teachers think are successful and any recommendations or changes they might make. I also interviewed four WEN volunteers who have volunteered for Fish Week several times each. Volunteers are able to give insight into

which parts of the field trips they see as most effective and engaging for students, as well as parts that they would change. These interviews also serve as supplementary information to answer the questions above.

Results

Does Fish Week participation give students a greater knowledge of watersheds and native fish species?

The 7th grade pre and post program surveys are mostly a knowledge assessment. I scored these from 1-12. The mean score and 95% confidence interval of the pre-program surveys was 3.744 ± 0.262 (n=170). The mean score and 95% confidence interval of the post-program surveys was 4.412 ± 0.453 (n=91). Using a two-sided t-test these means are significantly different with a $p < 0.05$ ($t = -42.468$, d.f.=90). While the mean post-program score is significantly higher than the mean pre-program score, the mean post-program score is still low at only 4.412 out of 12 points (36.8%). The questions that were missed the most were questions 4 and 5; only 1.1% of students answered both correctly on the pre-program surveys, and only 4.4% of students answered both correctly on the post-program surveys.

Two questions on the 8th grade survey were asked to assess knowledge retention. The first question, what are the 5 C's of a healthy river, was a multiple choice with one correct answer. The results are summarized in table 1. 88.9% of the students from WMS who participated in Fish Week last year answered correctly, whereas only 42.9% of the control group answered correctly. However, 42.9% of the control group did not answer the question at all, and only 9.5% of the WMS group didn't answer.

Table 1. Percentage of students in each group that answered "What are the 5 C's of a healthy river?" correctly, incorrectly, or left the question blank.

	correct	incorrect	did not answer
WMS students (n=63)	88.90%	1.60%	9.50%
Control group (n=56)	42.90%	14.20%	42.90%

The second question on the 8th grade survey, draw or list five things that make up a water food chain, was scored from 1-4 and students were given a zero if they didn't answer. I compared the means of the WMS group and the control group. The WMS group (n=63) had a mean score with 95% confidence interval of 1.524 ± 0.273 , and the control group (n=56) had a mean score with 95% confidence interval of 1.429 ± 0.273 . Using a two-sided t-test, the difference in means is statistically significant with a $p < 0.05$ ($t = 5.261$, $d.f. = 55$). However, the means of the two groups are both lower than 2. When the students who did not answered are removed, the mean score for the WMS group (n=48) is 2.00 and the mean score for the control group (n=41) is 1.95, so they are still very similar. Response rate for both groups was more equal for this question. All 7th graders learn about food webs in their science curriculum, regardless of whether they participate in Fish Week or not.

Part of this evaluation was to see if students gain knowledge about native fish species. The survey/quiz that WEN conducts does not address native fish at all. The native fish portion of Fish Week is done by Trout Unlimited as part of the WEN and WSCTU partnership. This portion needs to be evaluated more thoroughly.

To what extent does Fish Week engagement influence students' values and behaviors towards protecting local watersheds and native fish?

The 7th grade pre and post program surveys ask if students think that healthy watersheds are important and why (Appendix B, question 7). The keywords students used fell into some distinct groups, these are summarized in table 2. The most common answers on both the pre and post surveys mentioned protecting wildlife or protecting the ecosystem as a whole. Before Fish Week, most students mentioned wildlife in their answers, whereas after Fish Week more students mentioned the ecosystem as a whole. Another popular response was that healthy watersheds are important because our watershed is connected to other places and our water affects other places and people. This shows that students are considering the connectedness of ecosystems. Only about 2% of students on both the pre and post program surveys said that they do not think watersheds are important.

Table 2. Percentage of 7th grade students on the pre-program survey and post-program survey who said that they think watersheds are important grouped by certain key words, as well as percentage of students who did not answer and students who said they do not think watersheds are important.

Keywords	pre	post
Connected to other places	25.29%	20.88%
Wildlife	46.47%	32.97%
Ecosystem as a whole	35.88%	49.45%
Drinking water	12.94%	16.48%
Recreation	5.88%	8.79%
Did not answer	4.71%	3.30%
No, watersheds are not important	2.35%	2.20%

On the 8th grade survey, question 3 (Appendix C) addresses students' values towards watersheds. Students had to answer these on a scale of strongly disagree to strongly agree. I scored these strongly disagree=1, disagree=2, neutral=3, agree=4, strongly agree=5. The responses from the WMS group and the control group were very similar for all categories (Table 3).

Table 3. Mean score and 95% confidence interval for each value statement for WMS 8th graders and control group 8th graders. Score is based on a Likert scale, strongly disagree=1, disagree=2, neutral=3, agree=4, strongly agree=5.

	WMS (n=63)		control (n=56)	
	Mean	95% C.I.	Mean	95% C.I.
I value rivers/streams because humans need fresh water to survive.	4.21	0.22	4.07	0.24
I value rivers/streams because I like to recreate (fish, swim, boat, etc.) on them.	4.17	0.23	4.31	0.20
I value rivers/streams because they are important to my local economy (fishing, recreation, power, etc.)	4.03	0.22	3.96	0.23
I value rivers/streams because my family/friends spend time there.	4.05	0.20	3.77	0.25
I value rivers/streams because of the natural ecosystem they support.	4.24	0.19	3.95	0.22
I value rivers/streams because they are important to my religion or culture.	2.69	0.23	2.58	0.25
I value rivers/streams because I think they are beautiful.	3.98	0.21	4.07	0.20
I don't value rivers/streams.	1.29	0.15	1.39	0.18

Question 5 on the 8th grader survey (Appendix C) asks students if they think that the rivers and streams around Missoula make Missoula unique or special and why. This question addresses if students value having a healthy watershed in the place that they live. Of the WMS students, 79% said yes Missoula's streams and rivers make it special, 13% said no, and 8% didn't answer. Of the control group students, 66% said yes, 18% said no, and 16% didn't answer. All of the students that answered no, the rivers and streams in Missoula do not make it special and unique, said that other places also have rivers and streams. The students who said that Missoula is unique or special because of our watersheds had varied answers as to why. The most popular answers related to wildlife, recreation, beauty, tourism/economics, Missoula culture, healthy people,

clean water, and that it is a privilege to live near clean rivers and streams. These keywords were distributed similarly in the WMS and control groups.

To address behaviors, students were asked to select how many times they have done some specific behaviors related to watershed health (Appendix C, question 4). Each category was given a numerical value; never=0, 1-2 times=1, 2-5 times=2, more than 5 times=3. These numerical values were summed for each student then I found the average for each group. For the WMS group, the mean and 95% confidence interval is 6.65 ± 0.86 . For the control group, the mean and 95% confidence interval is 5.36 ± 0.52 . Using a two-sided t-test the means are significantly different with a $p < 0.05$ ($t = 26.10$, $d.f. = 55$). The students who participated in Fish Week the previous year reported more positive behaviors on average.

Teacher interview:

I was able to interview one teacher who has brought her students to Fish Week since it began. Coleen Windell is a 7th grade teacher at WMS. She used to be on the board at WEN and was a co-creator of Fish Week. Overall, she thinks that Fish Week has gone really well. The topics covered in Fish Week fit into the 7th grade biology curriculum at the end of the spring semester when they are covering food webs and energy transfer in ecosystems. Students seem to really enjoy the field trip portion of Fish Week. The transition from the Clark Fork River to Bancroft Pond changed some aspects of the field trip but was nice because it is walking distance from WMS. The fly-fishing activity is fun for students, but it would be more engaging if students could actually try fishing on the water. However, the logistics of this might be difficult. Ms. Windell felt that the volunteers are usually well prepared and knowledgeable. There could be some improvement to coordinating volunteers so there are enough people each day for each

station. Ms. Windell believes that the in-class presentation before the field trip is very useful, because students have some background knowledge going into the field trip and the field trip can be more hands-on and less lecturing. I mentioned the possibility of having a post field trip presentation at the end of the week to wrap up what was learned on the field trip and show students some opportunities for volunteering, service projects, education, and future careers in watershed ecology and conservation. Ms. Windell thought that this would be beneficial to students, especially considering that 8th graders in the International Baccalaureate program at WMS have to do a service learning project and very few, if any, have worked with WEN doing watershed science or conservation. Showing students some of the opportunities that WEN provides for volunteering and service learning may help some students who enjoyed Fish Week gravitate towards those options. Overall, Ms. Windell felt very positively about Fish Week and looks forward to it continuing in the future.

Volunteer interviews:

I was able to interview four volunteers who have been at Fish Week for 1-3 years. They all opted to remain anonymous for the purpose of this evaluation. Overall, the volunteers I talked to really enjoy Fish Week and think that students get a lot out of it. The macroinvertebrate station is the highlight of the field trip. “Looking at macroinvertebrates [students] really start to connect with their world” – WEN volunteer. Two volunteers expressed that looking at live macroinvertebrates is not something that students get to do every day, and the students really seem to enjoy it. A volunteer that did the nature walk station said that they felt the students got a chance to reflect on the ecosystem and what they were learning in a positive way. The volunteers overall felt prepared to teach their station.

Several of the volunteers expressed that they knew how to teach their station, but were not fully aware of what was happening at the other stations. They felt that knowing more about what students are learning at the other stations would help them at their station to know what to focus on. All of the volunteers noticed issues with having enough volunteers on each day of Fish Week. One recommended that all volunteers be trained on multiple stations in case they need to cover in other areas. The only station that was mentioned as needing some changes was the comparison from dry flies to real macroinvertebrates. This is not a very interactive station and students seem the most distracted when they have to sit and listen to a volunteer talk rather than doing a hands-on activity. The volunteer recommended that this station be turned into a game or something to make it more interactive.

Recommendations

These results show that there are benefits to students from Fish Week. Students are gaining knowledge, although they are still scoring low on a post-Fish Week quiz. The questions on the pre and post program survey are very specific and don't reflect the knowledge goals that Fish Week is trying to reach. I recommend that WEN change the pre and post program survey to a quiz that focuses more on the broader points that Fish Week is trying to make. For example, instead of asking students to pick specific aquatic macroinvertebrates that go through complete metamorphosis, ask them to identify a picture of what complete metamorphosis is. This will show that students understand the concept of complete and incomplete metamorphosis, rather than memorize the specific organisms that go through each. There is a gap in the evaluation because it does not address the native fish habitat station that WSCTU helps with. WEN should consider if they want to include this in their evaluation for Fish Week as a whole.

Student values don't seem to be affected by Fish Week, based on these surveys. However, it is interesting to see where student values lie. Most values centered around recreation, family, ecosystem health, and aesthetics. I recommend that WEN foster these values and focus on the "why do we care" aspect. I think that this is being done to some extent, but I would drive home this message strongly and allow students to share their own reasons that they care. Encourage students to continually reflect on why they care about the waterways around Missoula and if the field trip is adding anything new for them to think about.

The overall goal of environmental education is to promote environmentally responsible behavior. For short programs like Fish Week, it is unrealistic for them to meet this goal to the fullest. I believe that the goal of Fish Week is to spark interest in watershed health and ecosystem science in middle school students. It is important for WEN to foster this spark and show students that there are opportunities beyond Fish Week if they are interested in any aspect of watershed ecology. Ms. Windell mentioned that a follow-up presentation or video would be beneficial to show students some things that they can do if they liked the field trip. These include volunteer opportunities with WEN, joining WEN's Stream Team, participating in the annual Clark Fork Clean Up, partnering with WEN for their 8th grade IB service learning project, or pursuing education and careers in related fields. I recommend creating a post-Fish Week presentation or video that highlights key points, reflects on "why do we care", and shows students options for future involvement.

Surveying 8th graders who participated in Fish Week last year, compared to a control group, was helpful for this evaluation. However, the data is confounded by the fact that most of the control group had participated in some sort of field trip to the river in the past. The demographics of WMS and the control school are also slightly different. It is difficult to tell if

these were WEN field trips or what was covered on those field trips. In the future, I think that WEN's best student evaluation tool will be pre and post Fish Week quizzes and surveys for the 7th graders that are specific to Fish Week.

Logistically, Fish Week runs pretty smoothly. Currently, WMS students can walk to Bancroft Pond. If the location changes in future years (Rattlesnake Creek has been proposed) coordinating buses will present more of a challenge. Volunteers felt prepared overall, but were not prepared to take over other stations. This evaluation may be confounded by inconsistency in what information volunteers present and how they present it. More training would mean more consistency in the curriculum. I recommend that more volunteer training be conducted so volunteers understand what is happening at all of the stations. This will help them to know what to cover at their station, and also prepare them to take over other stations if there is a shortage of volunteers. I recommend that WEN also recruit more volunteers, although this presents a difficulty in late May when the University of Montana is out of session.

What steps does WEN need to take to integrate effective program evaluation into their Fish Week program?

The evaluation tools that WEN is currently using for Fish Week are giving WEN some information, but I think that they can be changed to provide more useful information. WEN needs to survey students, teachers, and volunteers to understand as much as they can about what goes well and what doesn't go well each year. These need to be in a format that are easy to analyze so that analysis can be done quickly each year. Descriptive statistics should be kept track of, like how many students participate, how many volunteers participate, etc. This can be useful

when writing grants and conveying the impact that Fish Week has. I created some tools for WEN to use in the future so they can incorporate formative evaluation into Fish Week each year.

I think that separating out student evaluation into a quiz for knowledge gain and a survey for field trip improvement and watershed values will be beneficial to WEN for formative evaluation. The current pre and post program student survey is primarily a knowledge assessment. I pulled out the knowledge assessment into a pre and post Fish Week quiz (Appendix D). This quiz has some of the same questions that have been asked in previous years, but some of the questions I focused on broader concepts rather than fine details. I worked with current and former teachers to develop questions that are appropriate for 8th grade students. This quiz could be used by WEN each year, or it could be left up to the teachers if they want to know what students are learning or hold students accountable to what they learn on the field trip.

In addition to the pre and post Fish Week quiz, I also made a post Fish Week student survey (Appendix E). This addresses what students like and dislike about Fish Week. Secondly, it addresses some of the students' future interests, like if they would be interested in volunteering for WEN or are interested in continuing to learn fly fishing. Lastly, it asks some of the values related questions that WEN is interested in hearing from students from year to year. This survey will give WEN some feedback about changes they can make from year to year to keep Fish Week exciting and relevant for students. It will also give them an idea if some students are interested in watershed health and monitoring and if they should follow up with teachers in the future about volunteer opportunities.

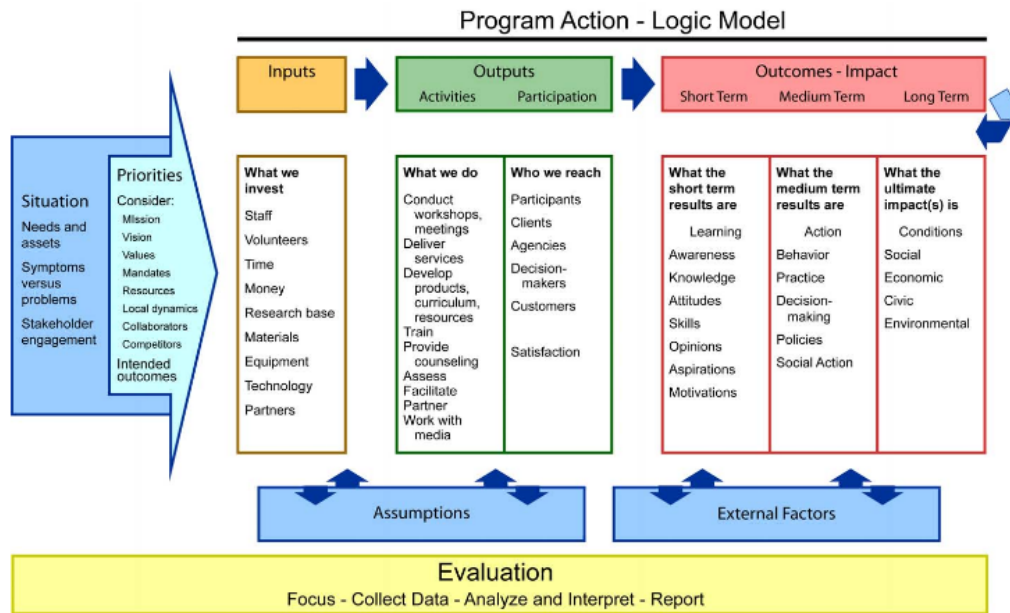
In order to get as much information as possible each year, I created a post Fish Week teacher survey (Appendix F) for teachers to give feedback. I also created a post Fish Week volunteer survey (Appendix G) for volunteers to give feedback.

Before Fish Week next year these will be integrated into an online survey format so WEN will not have to enter all of this data by hand

Appendix A. Logic Model Matrix (UACES)

PROGRAM DEVELOPMENT

Planning – Implementation – Evaluation



Appendix B. Fish Week 2017-2018 pre and post program survey.

Watershed Education Network
Spring 2018 Pre/Post Survey

Date: _____ Birth Date: _____ Grade: _____ School: _____ Teacher: _____

- 1) What are the 5 C's of a healthy river?
 - a. Complex, Connected, Clean, Clear, and Cold
 - b. Caddisflies, Clams, Crane flies, Crayfish, and aquatic Caterpillars
 - c. Connected Creeks Can Contain Coldwater
 - d. Cloudy, Convoluted, Contaminated, Clogged, and Chilly
- 2) Define the word bio-indicator.
 - a. Bio-indicators are chemical tests used to see if there is life in an aquatic habitat.
 - b. Bio-indicators are living organisms that give us an idea of the health of an ecosystem.
 - c. Bio-indicators are living organisms that can live in many different ecosystems, they're adaptable.
 - d. Bio-indicators are chemical tests used to see if there is not life in an aquatic habitat.
- 3) What are some adaptations insects make to moving water (rivers)?
- 4) Circle all that apply: Give an example of an aquatic macroinvertebrate that goes through complete metamorphosis.
 - a. Mayfly
 - b. Dragonfly
 - c. Stonefly
 - d. Caddisfly
- 5) Circle all that apply: Give an example of an aquatic macroinvertebrate that goes through incomplete metamorphosis.
 - a. Mayfly
 - b. Dragonfly
 - c. Stonefly
 - d. Caddisfly
- 6) Describe a pond habitat. (3 clear descriptions)
- 7) Do you think a healthy watershed is important? Why?

Appendix C. 8th grade Fish Week survey.

Watershed Education Network
Spring 2020 8th Grade Survey

Date: _____ Grade: _____ 7th Grade Teacher: _____

- 1) What are the 5 C's of a healthy river?
 - a. Complex, Connected, Clean, Clear, and Cold
 - b. Caddisflies, Clams, Crane flies, Crayfish, and aquatic Caterpillars
 - c. Connected Creeks Can Contain Coldwater
 - d. Cloudy, Convolutd, Contaminated, Clogged, and Chilly
- 2) Draw or list 5 living things that up a water food chain (river or creek) – use back of page if needed.

- 3) Think about why you value rivers and streams. Read each of the following statements and mark whether you strongly disagree, disagree, feel neutral, agree, or strongly agree...

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I value rivers/streams because humans need fresh water to survive.					
I value rivers/streams because I like to recreate (fish, swim, boat, etc.) on them.					
I value rivers/streams because they are important to my local economy (fishing, recreation, power, etc.)					
I value rivers/streams because my family/friends spend time there.					
I value rivers/streams because of the natural ecosystem they support.					
I value rivers/streams because they are important to my religion or culture.					
I value rivers/streams because I think they are beautiful.					
I don't value rivers/streams.					

- 4) Read the following statements and mark whether you participate in them never, occasionally, or frequently.

	Never	1-2 times	2-5 times	Over 5 times
I talked to my friends/family about watershed health.				
I went fly fishing.				
I recreated on a local stream/river (fishing, boating, swimming, etc.)				
I picked up trash in or near a local stream/river.				
I volunteered for the Clark Fork Cleanup.				
I volunteered for a local water-based non-profit (Watershed Education Network, Clark Fork Watershed Education Program, etc.)				

- 5) Do you think that having so many streams and rivers makes Missoula unique or special? Why?

- 6) When I am near rivers/streams I feel... (mark all that apply)

happy	<input type="checkbox"/>	scared	<input type="checkbox"/>	Other (please specify):
joyful	<input type="checkbox"/>	indifferent	<input type="checkbox"/>	
energized	<input type="checkbox"/>	bored	<input type="checkbox"/>	
peaceful	<input type="checkbox"/>	curious	<input type="checkbox"/>	
calm	<input type="checkbox"/>	interested	<input type="checkbox"/>	

- 7) Have you ever been on a field trip to a river or a pond? Yes ____ No ____

If yes, when was it? Last year ____ 2-3 years ago ____ Over 3 years ago ____

Appendix D. Pre and post Fish Week knowledge quiz for future use.

Watershed Education Network
Spring 20__ Pre/Post Quiz

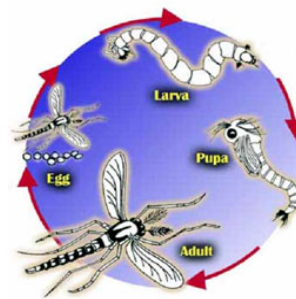
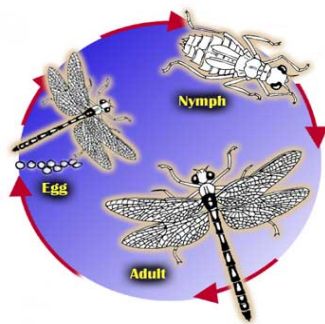
Date:_____ Grade:_____ School:_____ Teacher:_____

- 1) What are the 5 C's of a healthy river?
 - a. Complex, Connected, Clean, Clear, and Cold
 - b. Caddisflies, Clams, Crane flies, Crayfish, and aquatic Caterpillars
 - c. Connected Creeks Can Contain Coldwater
 - d. Cloudy, Convoluted, Contaminated, Clogged, and Chilly
- 2) Define the word bio-indicator.
 - a. Bio-indicators are chemical tests used to see if there is life in an aquatic habitat.
 - b. Bio-indicators are living organisms that give us an idea of the health of an ecosystem.
 - c. Bio-indicators are living organisms that can live in many different ecosystems, they're adaptable.
 - d. Bio-indicators are chemical tests used to see if there is not life in an aquatic habitat.

- 3) Complete the aquatic food chain.

Producer	Primary Consumer	Secondary Consumer
a. Algae	a. Algae	a. Algae
b. Dragonfly	b. Dragonfly	b. Dragonfly
c. Mayfly	c. Mayfly	c. Mayfly

- 4) Which of these is complete metamorphosis?



- 5) List 3 important components of good fish habitat.
- 6) Name 1 aquatic macroinvertebrate that you learned about on the field trip and list at least one characteristic that makes it unique or interesting.

Appendix E. Post Fish Week student survey for future use.

Watershed Education Network
Spring 20__ Post Survey - Students

Date:_____ Grade:_____ School:_____ Teacher:_____

- 1) What did you enjoy the most about Fish Week?

- 2) What did you enjoy the least about Fish Week?

- 3) Would you be interested in doing more water monitoring in the future?

- 4) Would you be interested in working with WEN on your 8th grade IB service project?

- 5) Do you think you will continue to pursue fly fishing as a recreational activity?

- 6) Do you think watersheds are important? Why?

- 7) Do you think that having so many streams and rivers makes Missoula unique or special?
Why?

Appendix F. Post Fish Week teacher survey for future use.

Watershed Education Network
Spring 20__ Post Survey – Teachers

Date:_____ School:_____

- 1) What parts of Fish Week did you enjoy the most?

- 2) Do you have any recommendations for changes to Fish Week?

- 3) Was the pre-field trip presentation a useful part of Fish Week?

- 4) Do you think that the Fish Week volunteer instructors were knowledgeable and well-prepared?

- 5) Do you have any other comments or questions about Fish Week?

Appendix G. Post Fish Week volunteer survey for future use.

Watershed Education Network
Spring 20__ Post Survey – Volunteers

Date: _____

- 1) What station(s) did you volunteer at?
- 2) Do you think that students enjoyed your station?
- 3) Do you think that students learned what they were supposed to at your station?
- 4) Do you feel like you had enough training and support as a Fish Week volunteer?
- 5) Do you have any recommendations for changes to Fish Week?
- 6) Would you volunteer for Fish Week again in the future?

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